COTTAGE POLLUTION CONTROL PROGRAM

District Municipality of Muskoka

Dickie Lake
Go Home Bay
Loon Lake
Muldrew Lake
Ril Lake
Turtle Lake

Simcoe County

Lake St. John

1976

Ontario
Ministry of the Environment

COTTAGE POLLUTION CONTROL PROGRAM

1976

DISTRICT MUNICIPALITY OF MUSKOKA

DICKIE LAKE	- TOWNSHIP OF LAKE OF BAYS
GO HOME BAY	- TOWNSHIP OF GEORGIAN BAY
LOON LAKE	- TOWN OF GRAVENHURST
MULDREW LAKE	- TOWN OF GRAVENHURST
RIL LAKE	- TOWNSHIP OF LAKE OF BAYS
TURTLE LAKE	- TOWN OF GRAVENHURST

SIMCOE COUNTY

LAKE ST. JOHN	- TOWNSHIP OF RAMA

The Cottage Pollution Control Survey field work included in this report was carried out by staff of the Muskoka-Haliburton District Office, Central Region.

GENERAL TABLE OF CONTENTS

PREFACE

Ontario's thousands of beautiful inland lakes provide an abundant resource for recreational enjoyment. To protect the quality of these waters, a delicate environmental balance must be maintained.

A heavy influx of people may subject a lake and its surrounding environment to great stress. Uncontrolled development and imprudent use of our recreational lakes may cause their deterioration and destroy their natural qualities.

The Ontario Ministry of the Environment is attempting to bring some of these stress factors under control by a variety of programs; one of these, the Cottage Pollution Control Program was initiated in 1970 to study the cottage waste disposal problem, to evaluate existing waste disposal systems and to enforce repairs to those found to be unsatisfactory.

The Ministry is carrying on research to improve the knowledge of septic tank operation and the movement of sewage effluent in shallow soils. Alternative methods of private waste disposal are also being evaluated.

SUMMARY

The Cottage Pollution Control Program was established to detect and have corrected faulty private sewage disposal systems of cottages located on recreational lakes. The objective of the program is to investigate and, in conjunction with the owner, to undertake abatement work on those systems found to be faulty.

In 1976 a total of 1,140 private sewage disposal systems were inspected on Dickie Lake, Go Home Bay, Loon Lake, Muldrew Lake, Ril Lake and Turtle Lake in the District Municipality of Muskoka and Lake St. John in Simcoe County. The inspection of these systems indicated that 25% were performing satisfactorily, 26% were found to be seriously sub-standard, 39% were discharging wash water or solid waste onto the ground surface, 3% were direct polluters and 7% were unclassified after the initial detection survey. See Appendix 1 for the summary of inspecttion results.

As of December 31st, 1976, 117 agreements for corrective work to be carried out had been signed by the owners. Corrections have been completed and inspected for 122 systems and 343 letters have been sent to owners advising them that their systems are undersized and should be upgraded in the near future.

Corrective action for inadequate sewage disposal systems on Lake St. John is being conducted by the Orillia office of the Simcoe County Health Unit.

Contacts with owners continued through the winter to arrange for corrective action to be taken to systems in the spring of 1977.

COTTAGE POLLUTION CONTROL SURVEY

PREPARATION

During the winter of 1975, a reconnaissance and mapping program was undertaken by snowmobile on the lakes.

The snowmobile crews counted the number of establishments on the lake, photographed and described every one hundredth establishment on the shoreline, plotted the cottages on maps and located non cottage properties such as marinas, camp grounds and lodges.

Data obtained from the snowmobile work, as well as that from Cottager Associations and other agencies, was used to prepare a work schedule for the student crews in the summer.

Prior to the commencement of the survey of each lake, a meeting was held with the Cottager Association during which members were given a brief outline of the survey procedures to be followed and also the information that would be required from each cottager. In certain cases, a mid-summer meeting was arranged with the Association at which time abatement procedures were discussed. The co-operation of the Associations contributed greatly to the success of the program.

Detection Surveys

The crews, each composed of two students, began the survey of each lake by preparing a description log in which each establishment was systematically numbered and accurately described. Using this log, individual establishments can be easily located for follow-up inspections.

Each establishment was then inspected to determine the type, size, location and design of sewage disposal systems; soil type and depth in the area of all tile beds; presence of leaching pits or privies; source of drinking water; and to provide data on other related factors.

A preliminary classification of all waste disposal systems was made by the students prior to referring the file to their supervisor for final classification.

Classification of Sewage Disposal Systems

The sewage disposal systems of all premises surveyed were classified into one of the following groups.

1. Satisfactory - the system meets all current standards of good design, construction and location, and is properly maintained.

2. Satisfactory (Acceptable) Performance - the system may not quite meet current standards of design and construction but is properly located with respect to distance from lake, well etc. and is maintained in good condition.

<u>Classification of Sewage Disposal Systems</u> (Cont'd)

3. Seriously Substandard - a system which does not meet current standards of design, construction, location, and/or is in a state of neglect. Although this system is not deemed to be causing pollution at the time of inspection, a potential hazard exists. The owner is notified of the deficiency and is advised that consideration should be given to updating the system in the near future.

4. Nuisance (Wash Water) - a system causing wash water to be exposed on the surface of the ground either directly through a waste pipe, escaping from a seepage pit or just thrown on the ground surface. Such a condition is known as a Public Health Nuisance. Wash water discharged from any sanitary fixture is contaminated and creates an unhealthy environment. Phosphates and other nutrients from waste discharges encourage weed growth and affect the aesthetic quality of the lake.

5. Nuisance (Toilet and Solid Waste) - a system causing a waste containing faecal or urinary discharges to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of a sewage disposal system including a privy. Also, included in this classification, is "solid waste" or garbage of a kind which can cause a "nuisance", e.g. domestic garbage containing food waste.

6. Direct Polluter - a system which is permitting sewage to contaminate the ground water or to reach the lake either by direct discharge through a pipe, ditch or over the ground surface.

7. Unclassified (temporarily) - a system which has been given a preliminary classification by the student inspector where he feels he cannot use any of the preceeding classifications and has doubts about all or part of the system. These systems require further inspection by the supervisor who will attempt to make a final classification after a thorough investigation.

8. Unclassified - a system (or systems) where it is not possible at the end of the survey to make a classification. Usually they amount to only a few abandoned premises.

WATER SAMPLING

The Public Health Laboratories provided the necessary water sample analysis to detect total and faecal coliforms in the lake water samples. These samples were important for the tracing of sources of pollution entering the lake. They were not taken in sufficient number or frequency to investigate the overall water quality of the lakes surveyed.

Drinking water samples were obtained when the cottager was using an untreated water supply. These samples were analysed at the Public Health Laboratory and any owner having a drinking water sample which showed unsatisfactory total or faecal coliforms was immediately informed to this effect and instructions were also sent regarding procedures for disinfecting the drinking water supply.

All lake water samples fell well within the criteria for total body contact recreational use of 1,000 total coliforms per 100 ml, and 100 faecal coliforms per 100 ml, as outlined in the Ministry of the Environment booklet "Guidelines and Criteria for Water Quality Management, July, 1974".

CORRECTIVE PROCEDURE

After the file was examined by the supervisor and the original classification was confirmed, it was referred to an Environmental Officer for abatement. The Environmental Officer then interviewed the establishment owner to advise him of the findings and to discuss corrective action. If the owner agreed with the findings, a corrective program was initiated. The owner signed an abatement agreement form stating the corrections which would be completed by a specific date. A final inspection was carried out upon completion of the corrective work and the sewage disposal system was appropriately reclassified.

In the case of commercial establishments, this procedure is more complicated and often requires an engineering study, the submission of plans, and soil analysis reports for approval. In these instances, unless the system is a direct polluter, the owner is contacted and is instructed to submit plans for the corrective measures which are to be completed prior to the opening of the next commercial season. A direct polluter must take corrective action immediately to prevent pollution of the lake.

METHODS OF SEWAGE DISPOSAL

Much of the shoreline property in Muskoka and Haliburton has minimal soil over bedrock and therefore is unsuitable in its natural state for sub-surface sewage disposal. This can be remedied in some areas by importing and placing suitable granular material over an area capable of supporting a sub-surface sewage disposal system. The use of a holding tank may provide a more economical solution for the disposal of sewage and may be recommended if a contract for the pump-out of the tank can be secured. On some lots where there is restricted space for a conventional sewage disposal system, the installation of a proprietary aerobic sewage treatment system may provide a viable alternative.

METHODS OF SEWAGE DISPOSAL (Cont'd)

Recently there have been many developments in sewage disposal systems and the Ministry of the Environment is continually monitoring new systems which are marketed in Ontario.

The Ministry of the Environment or other designated authority should be consulted and approval obtained before any sewage disposal system is installed.

ABATEMENT PROGRESS FROM 1975 COTTAGE POLLUTION CONTROL PROGRAM

During the summer of 1975 the Cottage Pollution Control Program was conducted on the following lakes in the District Municipality of Muskoka; Dark, Gull, Silver, Three Mile and Bala Bay (Lake Muskoka). Gull Lake in the Provisional County of Haliburton was also surveyed. A total of 1,448 private sewage disposal systems were inspected. Of these, 36% were performing satisfactorily, 21% were found to be seriously substandard, 35% were discharging wash water or solid waste onto the ground surface, 1% were direct polluters and 7% were unclassified after the initial detection survey. All of the owners with seriously substandard systems were contacted and advised that their system should be watched carefully since it may require updating in the near future. As of April 1st, 1977, 66% of the systems which required upgrading were completed. The majority of the remaining systems requiring upgrading have signed agreements by the owners for completion of corrective action during the summer of 1977. The abatement program will continue until all systems are in compliance.

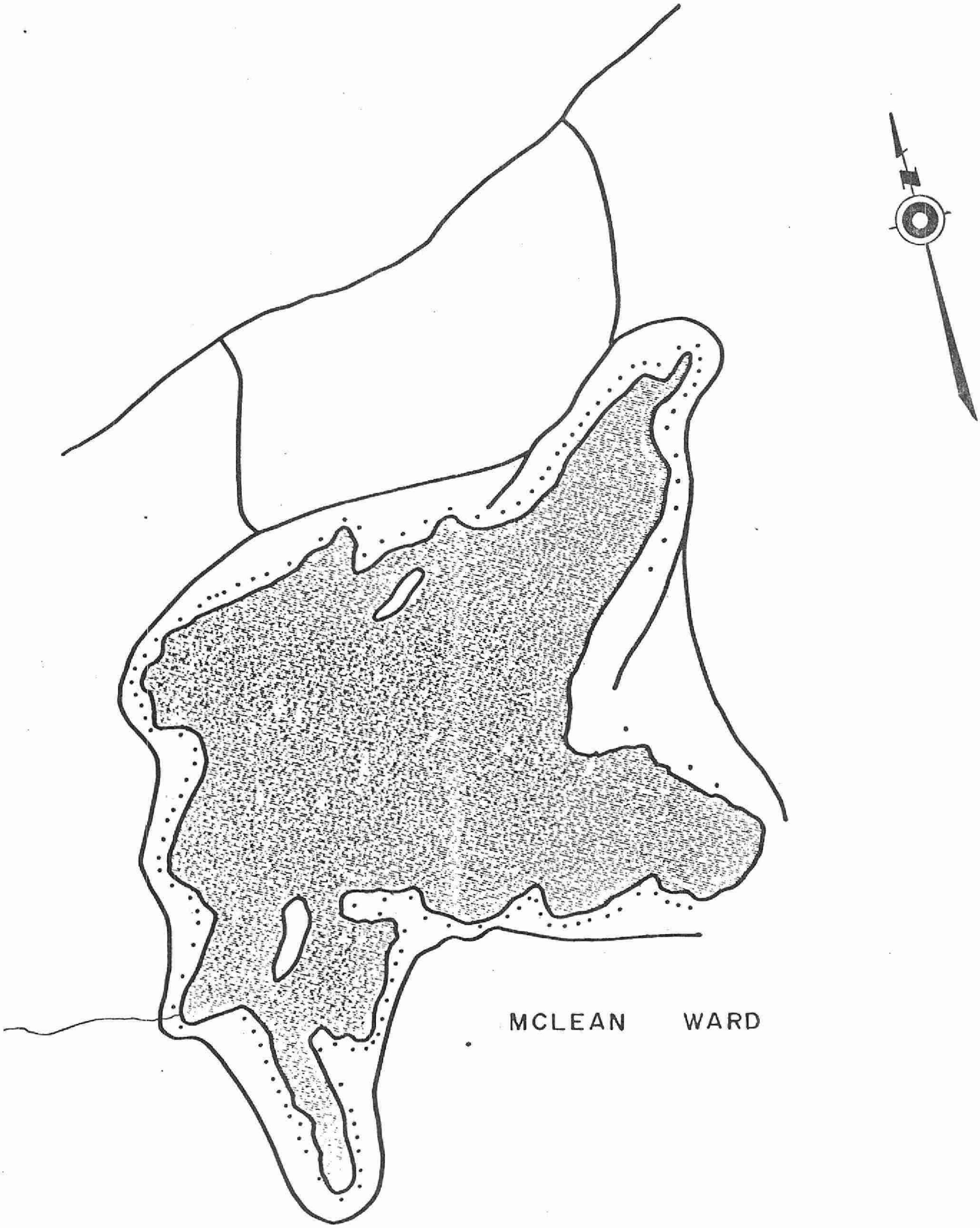
DICKIE LAKE

Dickie Lake is located in the District of Muskoka, Township of Lake of Bays, McLean Ward. The lake is located east of Baysville and south of Highway 117. All cottages on the lake have road access.

The lake is part of the Muskoka drainage basin, the outlet of which flows to the South Muskoka River. The two inlets are located in a Bay south of Russell Island. The outlet for Dickie Lake is also located in this Bay.

The surface area of the lake is 92 hectares (227 acres). The maximum depth is 11.5 metres (38 feet) with a mean depth of 4.4 metres (14.6 feet). The 7.4 kilometres (4.6 miles) of shoreline has 115 private cottage establishments. The shoreline soil consists of shallow till, while much of the land is granite or gneiss ridges.

The 1976 C.P.C.P. established that 28 or 24% of the cottage disposal systems inspected were substandard. There were 48 or 42% of the disposal systems found unsatisfactory. No direct polluting systems were found.



MINISTRY OF THE ENVIRONMENT

DICKIE LAKE

1976 COTTAGE POLLUTION
CONTROL PROGRAM

SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1976
CHECKED BY B.R.H.	DRAWING NO.

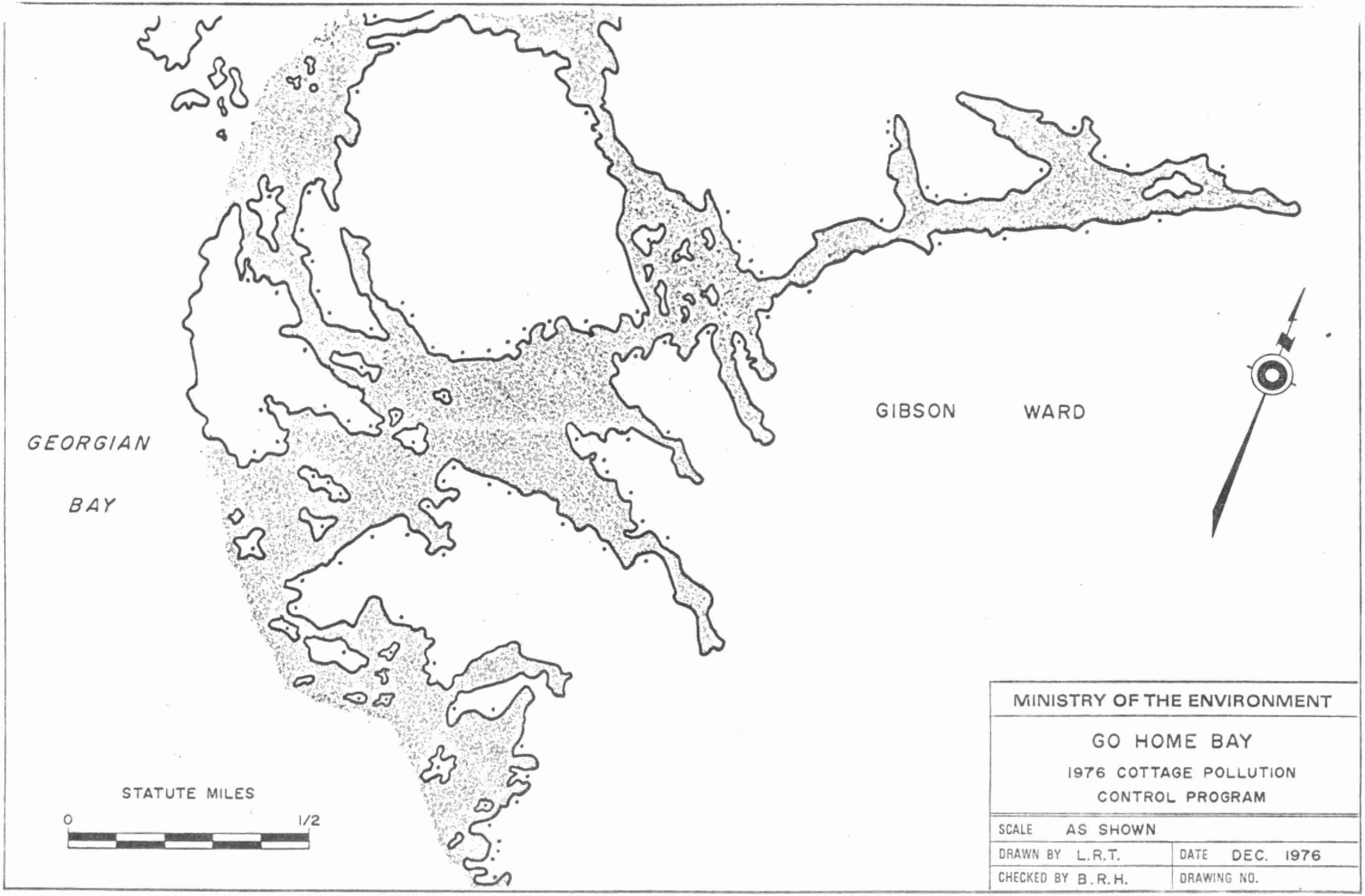
GO HOME BAY

Go Home Bay is located in Gibson Ward, in the Township of Georgian Bay, approximately 19.3 kilometres(12 miles) north of Honey Harbour on the eastern shore of Georgian Bay. Go Home Bay is a large inlet which joins Go Home Lake at the "Chute" (a small dam) at the eastern end of the Bay. The Bay area is surrounded by numerous islands and rock shoals; most notably Big Island, 294 hectares (727 acres) and Long Island, 70 hectares (172 acres).

The entire Go Home Bay area is accessible by water only. The shoreline consists of a high percentage of bare rock outcroppings and steep slopes while the back lands are covered by shallow sandy and clay soils. The outer islands along the south shore lack soil cover and tend to be bare rock outcrops.

Approximately 889 hectares (2,200 acres) of the western part of the Bay and island area is controlled and owned by the Madawaska Club Ltd., a cottage community incorporated in 1898.

During the summer of 1976, 119 sewage disposal systems were inspected, of which 5 or 4% were classified as seriously substandard; 73 or 62% were unsatisfactory because of improper disposal of solid wastes or wash water and 20 or 17% were classified as direct polluters.



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GO HOME BAY 1976 COTTAGE POLLUTION CONTROL PROGRAM	
SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1976
CHECKED BY B.R.H.	DRAWING NO.

LOON LAKE

Loon Lake is located in Muskoka South Ward, in the Town of Gravenhurst, approximately 6.4 kilometres (4 miles) from the town centre.

The shoreline of Loon Lake is predominately steep rocky outcrops, with minimal soil cover. The southerly shoreline has a greater overburden depth although rock outcroppings are visible.

Loon Lake occupies a small shallow rock trough, being part of the erosional rock formation centred around the Sparrow Lake Batholithic Pluton, a large rock dome structure.

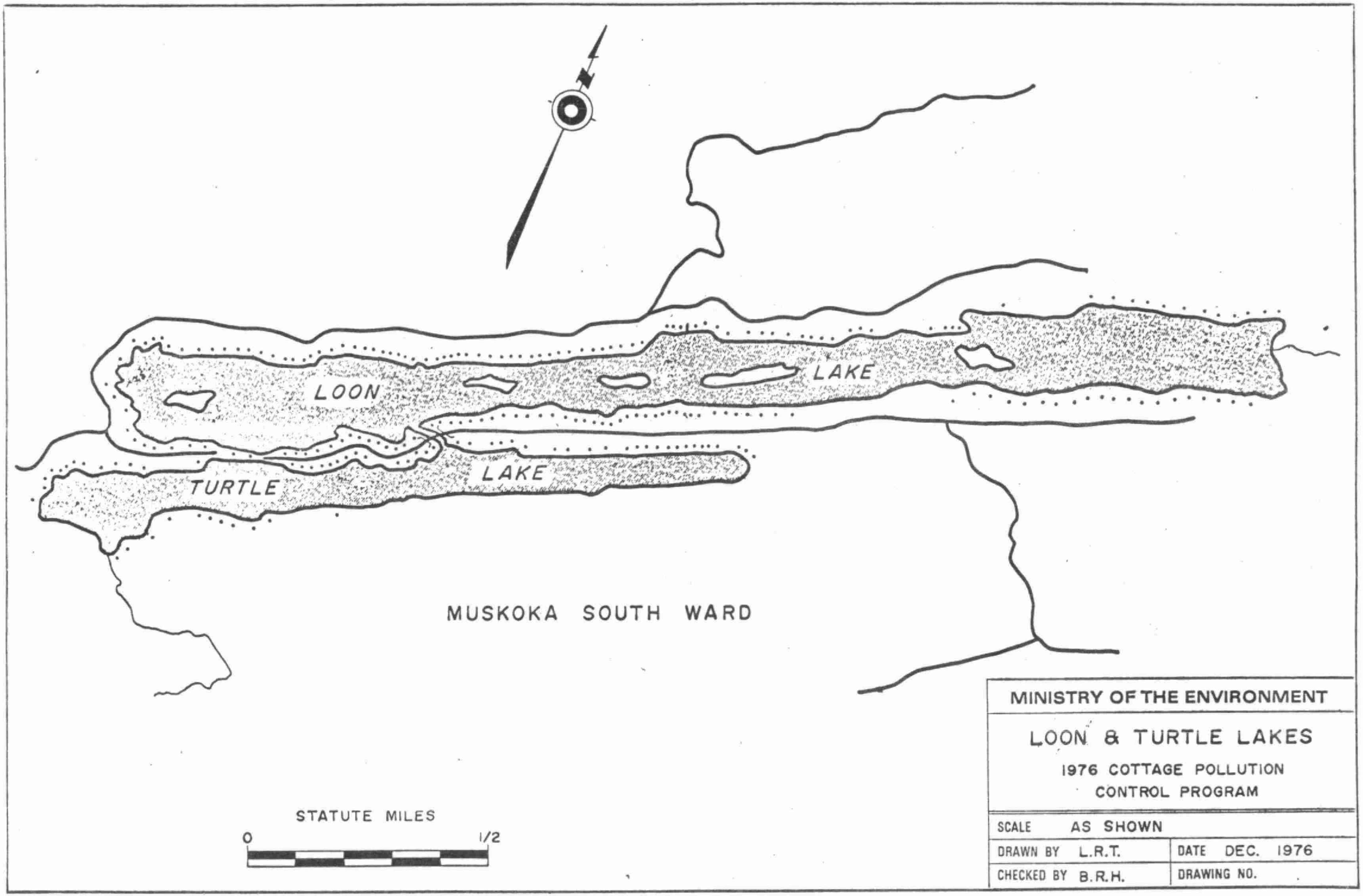
During the summer of 1975, 175 sewage disposal systems were inspected on Loon Lake; 74 or 42% of these systems were classified as seriously substandard; 48 or 27% were unsatisfactory because of improper disposal of solid waste or wash water; and 1 or 1% of the systems were classified as direct polluters.

TURTLE LAKE

Turtle Lake is located in Muskoka South Ward, in the Town of Gravenhurst, approximately 8.0 kilometres (5 miles) from the town centre.

The northern shore of the lake, accessible by road, is a moderately low area with a sandy overburden, while the southern shore is covered by clay and sand tills with predominate rock outcroppings. Turtle Lake is joined to Loon Lake by a small navigable channel.

During the summer of 1976, 63 sewage disposal systems were inspected, of which 17 or 27% were classified as seriously substandard; 22 or 35% were unsatisfactory because of improper disposal of solid wastes or wash water.



TRANSLAR 250-9-75

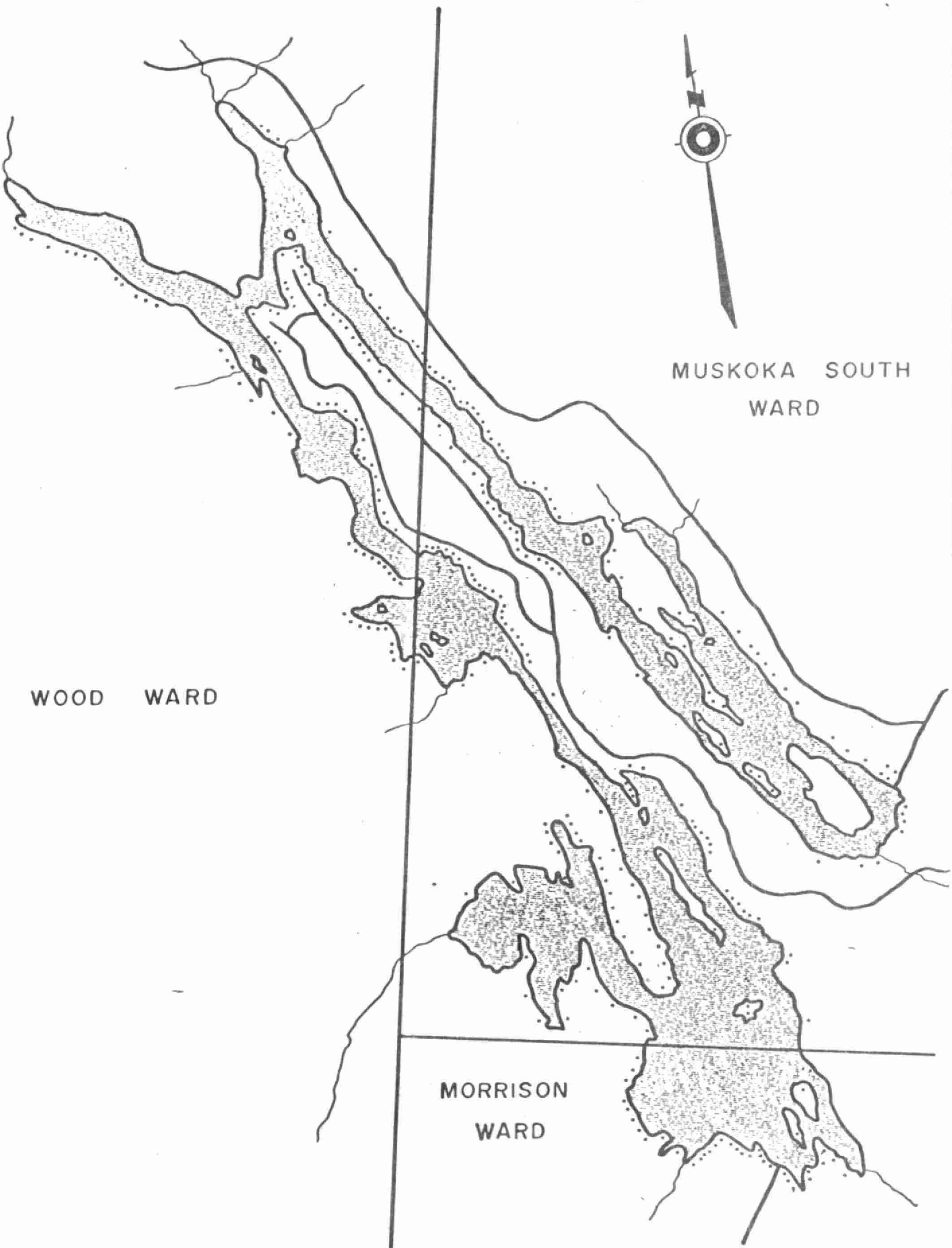
MULDREW LAKES: NORTH & SOUTH

These lakes are located in South Muskoka, Wood and Morrison Wards, part of the Area Municipality of Gravenhurst, approximately 4.8 kilometres (3 miles) west of the Town of Gravenhurst. The Muldrew Lakes, formerly known as Leg Lake, are essentially one lake divided by a large peninsula. They are characterized by numerous small rock islands and bays. Loon, Turtle and Bearpaw Lakes drain into the North Muldrew Lake through small creeks. The dammed outlet, at the south end of the lake, drains via Morrison Creek into Morrison Lake.

Most of the lake shoreline is accessible by road except the south shoreline of the South Lake. The shoreline consists of a high percentage of bare rock outcroppings and steep slopes, while the back lands are covered by thin sandy and humic soils, and swamplands.

Forest fires which occurred in the Muldrew-Loon Lake area during the early 20th Century, facilitated the removal of much of the natural soil cover in the area by extensive erosion. Therefore, there is little natural soil depth around the lake.

The lakes cover a surface area of 435 hectares (1,075 acres) and there is 44.2 kilometres (27.5 miles) of mainland shoreline and 6.3 kilometres (3.9 miles) of island shoreline. The maximum depth of the lake is 21.3 metres (70 feet) with a mean depth of 7.6 metres (25 feet). The colour of the water is brown and the transparency is not great because of suspended solids and the mineral content of the lake waters.



STATUTE MILES

0 1/2 1

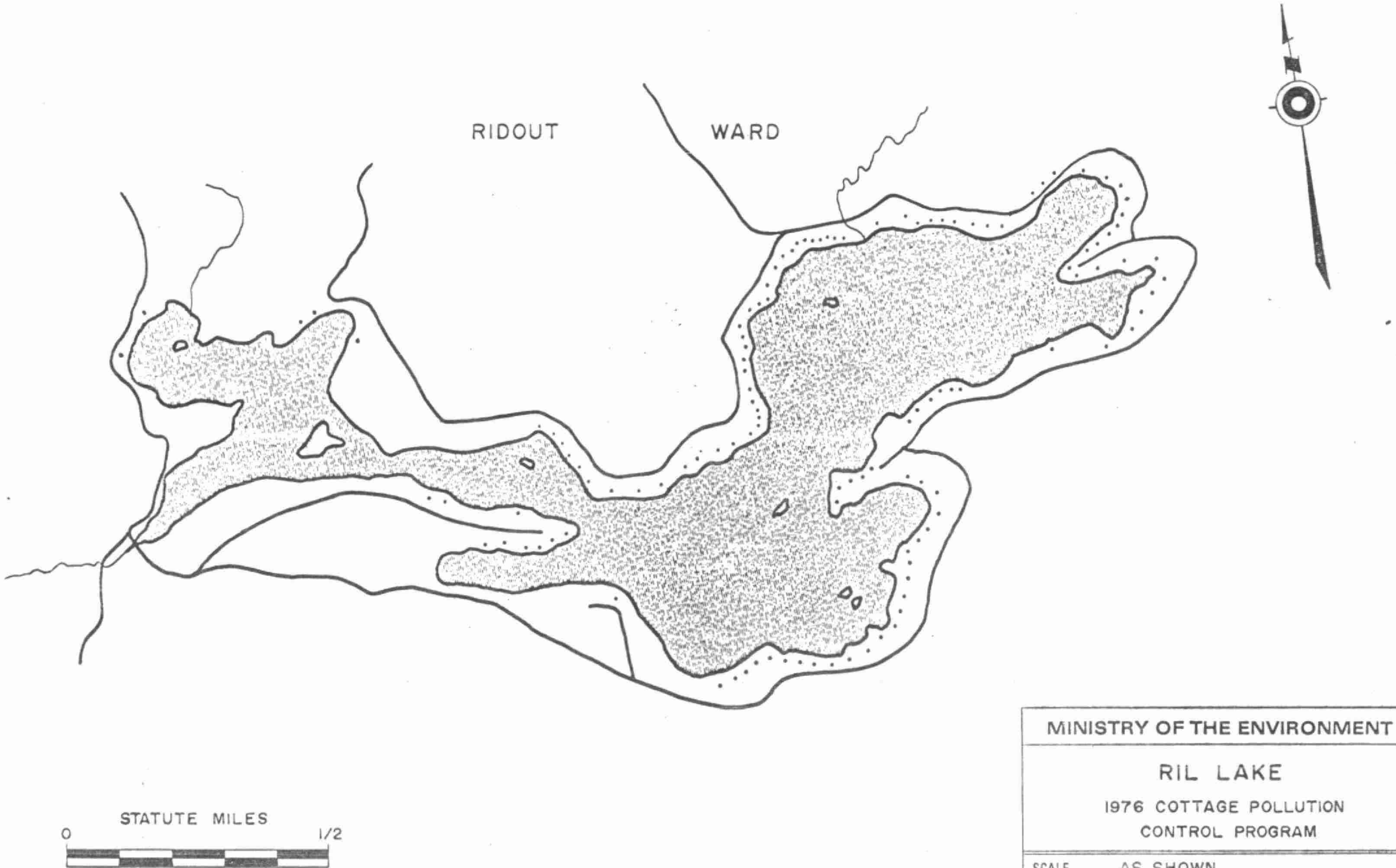
MINISTRY OF THE ENVIRONMENT	
MULDREW LAKE 1976 COTTAGE POLLUTION CONTROL PROGRAM	
SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1976
CHECKED BY B.R.H.	DRAWING NO.

RIL LAKE

Ril Lake, located in the District Municipality of Muskoka, Township of Lake of Bays, Ridout Ward, is accessible by a township road east of Highway 117, approximately 6.75 kilometres (4.2 miles) east of Baysville. All cottages have road access.

The lake is part of the Muskoka drainage basin. The outlet flows through the Kawpokwakog River to the South Muskoka River. There is one major inlet known as Mud Lake Creek. There are also two seasonal inlets. The surface area of the lake is 145.8 hectares (360.4 acres). The maximum depth is 9.1 metres (30 feet).

The 11.2 kilometres (7.0 miles) of shoreline has 138 private cottage establishments. The shoreline is shallow till and granite or gneiss ridges. The 1976 C.P.C.P. established that 35 or 25% of the cottage disposal systems inspected were substandard. There were 66 or 48% of the disposal systems found unsatisfactory. Two systems or 1% were direct polluters.



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RIL LAKE 1976 COTTAGE POLLUTION CONTROL PROGRAM	
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LAKE ST. JOHN

Lake St. John, situated in Simcoe County, Rama Township, approximately 13 kilometres (8 miles) from Orillia, is a lake of approximately 526 hectares (1,300 acres) with a depth of 7.6 metres (25 feet) or less. The northern and eastern shores of the lake are within the Rama Indian Reserve, while the Village of Longford Mills, and Chemical Developments of Canada Ltd. are located on the southwestern corner of the lake. A small trailer park is located on the northwest corner of the lake.

During the spring thaw and runoff, a shallow productive lake to the southeast, known as Mud Lake, overspills into Lake St. John. The only outlet from Lake St. John is via the St. John Creek which joins the Black River flowing into Lake Couchiching.

The shoreline is low in elevation with predominately sand and clay soil. Limestone plains occupy the western shoreline and an intrusion of the granitic Canadian Shield is evident on the north shore of the lake.

During the summer of 1976, 144 sewage disposal systems were inspected of which 34 or 23% were classified as seriously substandard; 41 or 28% were found to be unsatisfactory because of improper disposal of solid wastes or wash wastes and 2 or 1% were classified as direct polluters.


RAMA TOWNSHIP
21
STATUTE MILES
0
1/2
MINISTRY OF THE ENVIRONMENT
LAKE SAINT JOHN
1976 COTTAGE POLLUTION
CONTROL PROGRAM
SCALE AS SHOWN
DRAWN BY L.R.T.
DATE DEC. 1976
CHECKED BY B.R.H.
DRAWING NO.

SECCHI DISC-CHLOROPHYLL a SELF-HELP PROGRAM

The "Self Help Program" was initiated in 1971 in response to requests for water quality surveys from concerned cottagers on many recreational lakes throughout the Province. Previous experience indicated that the enrichment status of a lake can be estimated relatively easily by using Secchi disc readings and chlorophyll a concentrations (the green pigment in algae) to give an indication of water clarity and algal density respectively.

Cottage Associations are supplied with sampling kits which includes a Secchi disc, a water sampler, bottles and instructions. Participants are asked to take Secchi readings and to collect water samples bi-weekly during the ice-free period of the year. The water samples are shipped to the nearest Ministry of the Environment laboratory where they are analyzed for chlorophyll a. The true value of the program is only realized if it is continued for a number of years in order to delineate long term trends.

Mean annual Secchi disc readings and chlorophyll a concentrations in un-coloured lakes have been grouped into approximate ranges to indicate the status of enrichment.

SECCHI DISC (S.D.) (metres - m)		CHLOROPHYLL a (Chloro-a) (micrograms per litre-ug/l)	
Enriched	0-3 m	High Algal Density	4 ug/l or greater
Moderately Enriched	3-5 m	Moderate Algal Density	2-4 ug/l
Unenriched	5 m or greater	Low Algal Density	0-2 ug/l

The trophic status of the lakes, studied by the Cottage Pollution Control Program in 1976, is indicated in Appendix II. Lake St. John and Dickie Lake were not involved in the Self-Help Program.

Loon and Turtle Lakes were found to be enriched, while Muldrew, Ril and two stations in Go Home Bay indicated a moderate enrichment status.

APPENDIX I

PRELIMINARY CLASSIFICATION OF SYSTEMS INSPECTED

1976

BODY OF WATER	NUMBER OF SYSTEMS INSPECTED	CLASSIFICATION OF SYSTEMS															
		SATISFACTORY		SATISFACTORY PERFORMANCE		SERIOUSLY SUBSTANDARD		NUISANCE (WASH WATER)		NUISANCE (SOLID WASTE)		DIRECT POLLUTER		UNCLASSIFIED TEMPORARILY		UNCLASSIFIED	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dickie Lake	121	29	24	15	12	28	23	15	12	21	18	0	0	12	10	1	1
Go Home Bay	119	4	3	5	4	5	4	22	19	51	43	20	17	11	9	1	1
Loon Lake	175	24	14	20	11	74	42	27	15	21	12	1	1	8	5	0	0
Muldrew Lake	378	32	8	49	13	104	28	79	21	91	24	4	1	19	5	0	0
Ril Lake	140	15	11	18	13	37	27	21	15	33	24	3	1	13	9	0	0
Lake St. John	144	29	20	24	17	34	24	20	14	21	14	2	1	14	10	0	0
Turtle Lake	63	7	11	11	17	17	27	15	24	7	11	0	0	6	10	0	0
TOTALS	1,140	140	12	142	13	299	26	199	18	245	21	30	3	83	7	2	0

~~APPENDIX II~~

MEAN CHLOROPHYLL a AND SECCHI DISC MEASUREMENTS

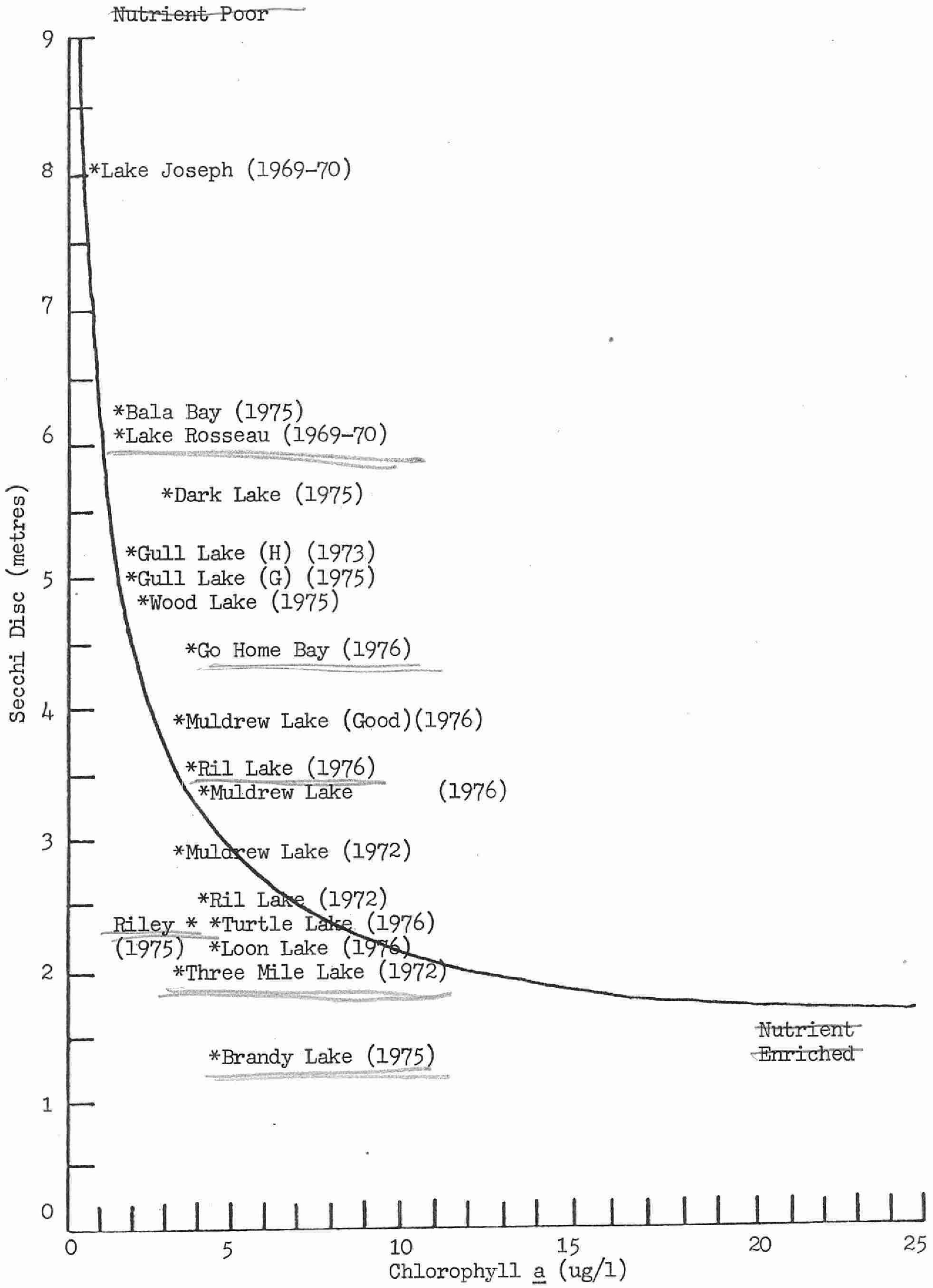


Figure: B ~~Mean Chlorophyll a and Secchi Disc Measurements~~

INFORMATION OF GENERAL INTEREST TO COTTAGERS

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups: the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease causing micro-organisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious waterborn infections such as typhoid fever, polio or hepatitis, but he may catch less serious infections of gastro-enteritis (sometimes called stomach flu), dysentery or diarrhea. Included in these minor afflictions are eye, ear and throat infections that swimmers encounter every year and the more insidious but seldom diagnosed, subclinical infections usually associated with several waterborn viruses. These viral infections leave a person not feeling well enough to enjoy holidaying although not bedridden. This type of microbial pollution can be remedied by preventing wastes from reaching the lake and water quality will return to satisfactory conditions within a relatively short time (approximately 1 year) since disease causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise, in turn, to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lake bacteria. Unfortunately, biodegradation of the organic wastes by organisms uses correspondingly large amounts of dissolved oxygen. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxygen supply in the bottom waters and threaten the survival of many deep-water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of the Recreational Lakes. Heavy precipitation has been shown to flush the land area around the lake and the subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, faecal coliforms and faecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Pre-Cambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up within 12 to 48 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals and birds (all of which can be carriers of disease); consequently, NO SURFACE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment including disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

(a) Boiling

Boil the water for a minimum of five minutes to destroy the disease causing organisms.

(b) Chlorination using a household bleach containing 4% - 5% available chlorine.

Eight drops of household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

(c) Continuous Chlorination

For continuous water disinfection, a small domestic hypochlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

(d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at 5% available chlorine) if the depth of water and diameter of the well are known.

CHLORINE BLEACH
Per 10 ft. Depth of Water

Diameter of Well Casing in Inches	One to Ten Coliforms	More Than Ten Coliforms
4	0.5 oz.	1 oz.
6	1 oz.	2 oz.
8	2 oz.	4 oz.
12	4 oz.	8 oz.
16	7 oz.	14 oz.
20	11 oz.	22 oz.
24	16 oz.	31 oz.
30	25 oz.	49 oz.
36	35 oz.	70 oz.

Allow about six hours of contact time before using the water.

Another bacteriological sample should be taken after one week of use.

Water sources (spring, lake, well, etc.) should be inspected for possible contamination routes (surface soil, runoff following rain and seepage from domestic waste disposal sites). Attempts at disinfecting the water alone without removing the source of contamination will not supply bacteriologically safe water on a continuing basis.

There are several types of low cost filters (ceramic, paper, carbon, diatomaceous earth sometimes impregnated with silver, etc) that can be easily installed on taps or in water lines. These may be useful to remove particles, if water is periodically turbid, and are usually very successful. Filters, however, do not disinfect water but may reduce bacterial numbers. For safety, chlorination of filtered water is recommended.

SEPTIC TANK INSTALLATIONS

In Ontario, provincial law requires under Part VII of The Environmental Protection Act, 1971, that before you extend, alter, enlarge or establish any

building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to issue the Certificate of Approval. Any other pertinent information such as size, types and location of septic tanks and tile fields can also be obtained from the same authority.

General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake, stream, pond, spring, river or reservoir
- 5 feet to any building
- 10 feet to any property boundary

The tile field should not be closer than:

- 100 feet to the nearest dug well
- 50 feet to a drilled well which has a casing to 25 feet below ground
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed
- 10 feet to any other building
- 10 feet to a property boundary
- 50 feet to any lake, stream, pond, spring, river or reservoir

The ideal location for a tile field is in a well-drained, sandy loam soil remote from any wells or other drinking water sources. For the tile field to work satisfactorily, there should be at least 3 feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

Recognizing that private sewage systems are relatively inefficient where shallow and inappropriate soil conditions are present (e.g. Pre-Cambrian areas) the Ministry of the Environment is conducting research into alternate

methods of private sewage disposal in un-sewered areas; into the improvement of existing equipment and methods of design and operation for these systems; and into the development of better surveillance methods such as by the use of chemical, biological and radioactive tracers to detect the movement of pollutants through the soil mantle.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest among cottage owners to dye test their sewage systems; however, several problems are associated with dye testing. Dye would not be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his system and no dye was visible in the lake, he would assume that his system is satisfactory, which might not be the case. A low concentration of dye is not visible and therefore expensive equipment such as a fluorometer is required. Only qualified people with adequate equipment are capable of assessing a sewage system by using dye. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region and the shape and flow of the shifting water table are required. Therefore, we recommend that this type of study should be performed only by qualified professionals.

BOATING & MARINA REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats, must be retained in suitable equipment. Equipment which is considered suitable by the Ministry of the Environment

includes (1) retention devices with or without re-circulation which retain all toilet wastes for disposal ashore , and (2) incinerating devices which reduce all sewage to ash.

Equipment for storage of toilet wastes shall:

1. be non-portable
2. be constructed of structurally sound material
3. have adequate capacity for expected use
4. be properly installed, and
5. be equipped with the necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with $1\frac{1}{2}$ inch diameter National Pipe Thread is commonly used).

Ontario Regulation #646 requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "Tips" may be of assistance to you in boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.

5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent "blow-back".
6. Empty oil cans must be deposited in a leak-proof receptacle, and
7. Slow down and save fuel.

EUTROPHICATION OR EXCESSIVE FERTILIZATION AND LAKE PROCESSES

In recent years, cottagers have become aware of the problems associated with nutrient enrichment of recreational lakes and have learned to recognize many of the symptoms characterizing nutrient enriched (eutrophic) lakes. It is important to realize that small to moderate amounts of aquatic plants and algae are necessary to maintain a balanced aquatic environment. They provide food and a suitable environment for the growth of aquatic invertebrate organisms which serve as food for fish. Shade from large aquatic plants helps to keep the lower water cool, which is essential to certain species of fish and also provides protection for young game and forage fish. Numerous aquatic plants are utilized for food and/or protection by many species of waterfowl. However, too much growth creates an imbalance in the natural plant and animal community particularly with respect to oxygen conditions, and some desirable forms of life such as sport fish are eliminated and unsightly algae scums can form. The lake will not be "dead" but rather abound with life which unfortunately is not considered aesthetically pleasing. This change to poor water quality becomes apparent after a period of years during which extra nutrients are added to the lake. A return to the natural state may also take a number of years after the nutrient inputs are stopped.

Change in water quality with depth is a very important characteristic of a lake. Water temperatures are uniform throughout the lake in the early spring and winds generally keep the entire volume well mixed.

Shallow lakes may remain well mixed all summer so that water quality will be the same throughout. On the other hand, in deep lakes, the surface waters warm up during late spring and early summer and float on the cooler, more dense water below. The difference in density offers a resistance to mixing by wind action and many lakes do not become fully mixed again until the surface waters cool down in the fall. The bottom water receives no oxygen from the atmosphere during this static period and the dissolved oxygen supply may be used up by bacteria as they decompose organic matter. Cold water fish, such as trout, will have to move to the warm surface waters to get oxygen and because of the high water temperatures they will not thrive. (see Figure next page).

Low oxygen conditions in the bottom waters are not necessarily an indication of pollution, but excessive aquatic plant and algae growth and subsequent decomposition in the bottom waters can aggravate the condition. In some cases, this can result in zero oxygen levels in lakes which had previously held some oxygen in the bottom waters all summer. Alghough plant nutrients normally accumulate in the bottom waters of lakes, they do so to a much greater extent if there is no oxygen present. These nutrients become available to the surface waters when the lake mixes in the fall and dense algae growths can result. Consequently, lakes which have no oxygen in the bottom water during the summer are more prone to having algae problems and are more vulnerable to nutrient inputs than lakes which retain some oxygen.

Like humans, aquatic plants and algae require a balanced "diet" for growth. Other special requirements, including those for light and temperature, are specific for certain algae and plants. Chemical elements such as nitrogen, phosphorus, carbon, and several others are required and must be in forms which are available for intake by plants and algae. Growth of algae

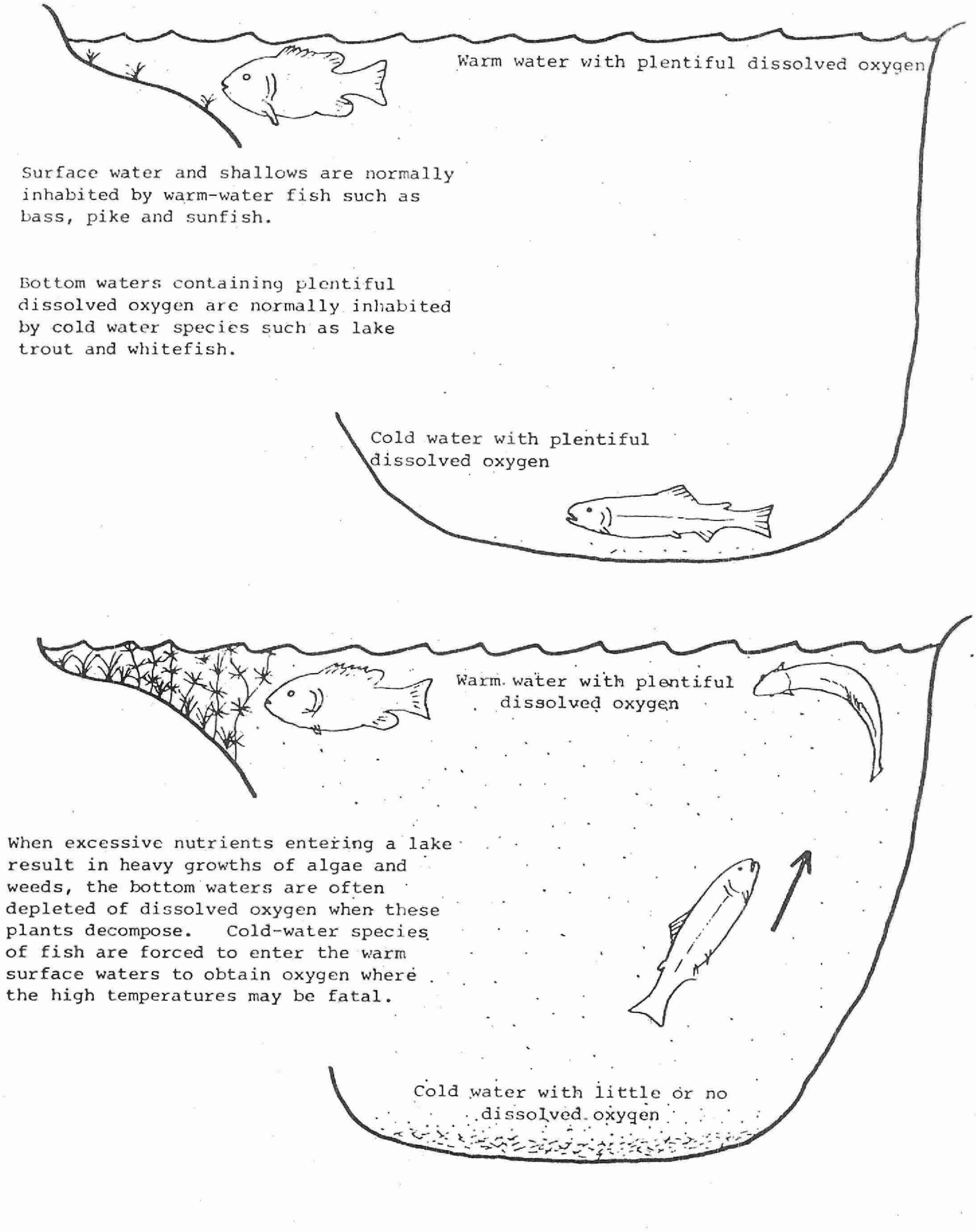
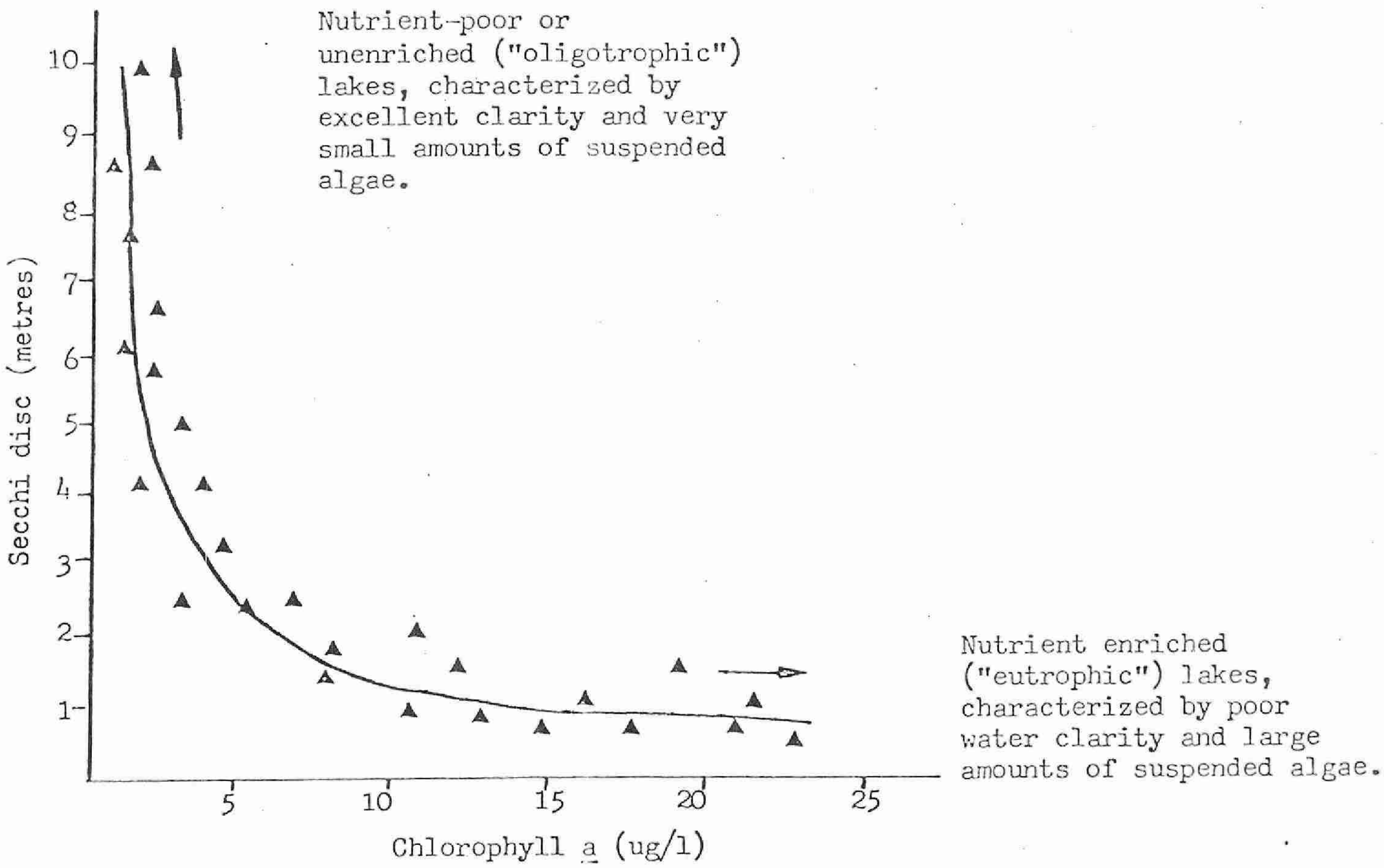


FIGURE A-1: DECOMPOSITION OF PLANT MATTER AT THE LAKE BOTTOM CAN LEAD TO DEATH OF DEEP-WATER FISH SPECIES.

can be limited by a scarcity of any single "critical" nutrient. Nitrogen and phosphorus are usually considered "critical" nutrients because they are often in scarce supply in natural waters, particularly in lakes in the Pre- Cambrian area of the province. Phosphorus is especially necessary for the processes of photosynthesis and cell division. Nitrogen and phosphorus are generally required in the nitrate-N (or ammonia-N) and phosphate forms, and are present in natural runoff and precipitation. Human livestock wastes are very significant sources of these and other nutrients for lakes in urban and agricultural areas. It is extremely important that cottage waste disposal systems function so that seepage of nutrients to the lake does not occur, since the changes in water quality brought about by excessive inputs of nutrients are usually evidenced by excessive growths of algae and aquatic plants.

The large amounts of suspended algae which materialize from excessive inputs of nutrients result in water of poor clarity or transparency. On the other hand, lakes with only small, natural inputs of nutrients and correspondingly low nutrient concentrations (characteristically large and deep lakes) most often support very small amounts of suspended algae and consequently are clear-water lakes. An indication of the degree of enrichment can therefore be gained by measuring the density of suspended algae (as indicated by the chlorophyll a concentration - the green pigment in most plants and algae) and water clarity (measured with a Secchi disc). In this regard, staff of the Ministry of the Environment have been collecting chlorophyll a and water clarity data from several lakes in Ontario, and have developed a graphic relationship between these parameters which is used by cottagers to further their understanding of the processes and consequences of nutrient enrichment of Pre-Cambrian Lakes.

The figure below indicates the previously mentioned relationship.



In the absence of excessive coloured matter (e.g. drainage from marshlands), lakes which are very low in nutrients are generally characterized by small amounts of suspended algae (i.e. chlorophyll a), and are clearwater lakes with high Secchi disc values. Such lakes, with chlorophyll a and Secchi disc values lying in the upper left area of the graph are unenriched or nutrient-poor ("oligotrophic"), and do not suffer from the problems associated with excessive inputs of nutrients. In contrast, lakes with high chlorophyll a concentrations and poor clarity are positioned in the lower right area of the graph and are enriched ("eutrophic"). These lakes usually exhibit symptoms of excessive nutrient enrichment, including water turbidity owing to large amounts of suspended algae which may float to the surface and accumulate in sheltered areas around docks and in bays.

Measurements of suspended algal density (chlorophyll a) and water clarity are especially valuable if carried out over several years. Year to year positional changes on the graph can then be assessed to determine whether or not changes in water quality are materializing so that remedial measures can be implemented before conditions become critical.

CONTROL OF AQUATIC PLANTS AND ALGAE

Usually aquatic weed growths are heaviest in shallow shoreline areas where adequate light and nutrient conditions prevail.

Extensive aquatic plant and algal growths sometimes interfere with boating and swimming, and ultimately diminish shoreline property values.

Control of aquatic plants may be achieved by either chemical or mechanical means. Chemical methods of control are currently the most practical, considering the ease with which they are applied. However, the herbicides and algicides currently available generally provide control for only a single season. It is important to ensure that an algicide or herbicide which kills the plants causing the nuisance, does not affect fish or other aquatic life, and should be reasonable in cost. At the present time, there is no one chemical which will adequately control all species of algae and other aquatic plants. Chemical control in the province is regulated by the Ministry of the Environment and a permit must be obtained prior to any operation. Simple raking and chain dragging operations to control submergent species have been successfully employed in a number of situations; however, the plants soon re-establish themselves. Removal of weeds by underwater mowing techniques is certainly the most attractive method of control and is currently being evaluated in Chemung Lake near Peterborough. Guidelines and summaries of control methods, and applications for permits are available from the Pesticides Control Section, Ministry

of the Environment, Pesticides Control Section, 12 Fairview Road, Box 937, Barrie, Ontario, L4N 4P3.

PHOSPHORUS AND DETERGENTS

Scientists have recognized that phosphorus is the key nutrient in stimulating algae and plant growth in lakes and streams.

In the past, approximately 50% of the phosphorus contributed by municipal sewage was added by detergents. Federal regulations reduced the phosphate content of P_2O_5 in laundry detergents from approximately 50% to 20% on August 1, 1970 and to 5% on January 1, 1973.

It should be recognized that automatic dishwashing compounds were not subject to the government regulations and that surprisingly high numbers of automatic dishwashers are present in resort areas (a questionnaire indicated that about 30 percent of the cottages in the Muskoka lakes have automatic dishwashers). Cottagers utilizing such conveniences may be contributing significant amounts of phosphorus to recreational lakes because automatic dishwashing compounds are characteristically high in phosphorus. In most of Ontario's vacation land the source of domestic water is soft enough to allow the exclusive use of liquid dishwashing compounds or soap and soap-flakes which are relatively low in phosphorus.

ONTARIO'S PHOSPHORUS REMOVAL PROGRAM

In 1976, the Government of Ontario expects to have controls in operation at more than 200 municipal wastewater treatment plants across the province serving some 4.7 million persons. This represents about 90 percent of the population serviced by sewers. The program is in response to the International Joint Commission recommendations, as embodied in the Great

Lakes Water Quality Agreement, and studies carried out by the Ministry of the Environment on inland recreational waters which showed phosphorus to be a major factor influencing eutrophication. Specifically, the program makes provision for nutrient control in the Upper and Lower Great Lakes, the Ottawa River system, and in prime recreational waters where the need is demonstrated or where emphasis is placed upon prevention of localized accelerated eutrophication.

Phosphorus removal facilities became operational at waste-water treatment plants on December 31, 1973, in the most critically affected areas of the province, including all the plants in the Lake Erie drainage basin and the inland recreational areas. The operational date for plants discharging to waters deemed to be in less critical condition, which includes plants larger than one million gallons per day (1 mgd) discharging to Lake Ontario and to the Ottawa River system, was December 31, 1975. The 1973 phase of the program involved 113 plants, of which 48 are in prime recreational areas. An additional 53 new plants, each with phosphorus removal, are now under development, 23 of which are located in recreational areas. The capacities of these plants range of 0.04 to 24.0 mgd, serving an estimated population of 1,600,000 persons.

The 1975 phase brought into operation another 54 plants ranging in size from 0.3 to 180 mgd serving an additional 3,100,000 persons. Treatment facilities utilizing the Lower Great Lakes must meet effluent guidelines of less than 1.0 milligram per litre of total phosphorus in their final effluent. Facilities utilizing the Upper Great Lakes, the Ottawa River Basin and certain areas of Georgian Bay where needs have been demonstrated, must remove at least 80 percent of the phosphorus reaching their sewage treatment plants.

CONTROL OF BITING INSECTS

Mosquitoes and blackflies often interfere with the enjoyment of recreational facilities at the lakeside vacation property. Pesticidal spraying or fogging in the vicinity of cottages produces extremely temporary benefits and usually do not justify the hazard involved in contaminating the nearby water. Eradication of biting fly populations is not possible under any circumstances and significant control is rarely achieved in the absence of large-scale abatement programmes involving substantial funds and trained personnel. Limited use of approved larvicides in small areas of swamp or in rain pools close to residences on private property may be undertaken by individual landowners, but permits are necessary wherever treated waters may contaminate adjacent streams or lakes. The use of repellents and light traps is encouraged as are attempts to reduce mosquito larval habitat by improving land drainage. Applications for permits to apply insecticides as well as technical advice can be obtained from the Ministry of the Environment, Pesticides Control Section, 12 Fairview Road, Box 937, Barrie, Ontario, L4N 4P3.